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ON THE LIFE HISTORY OF TABANUS VIVAX.

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EGGS.—Deposited in masses composed of several hundreds, on stones that project above the water in riffles. Mass nearly round in outline, only slightly convex, composed of about three layers one above the other. Color of the whole mass brown, mottled over the top with whitish. Female observed ovipositing June eighth.

LARVA.—In September and October of various years, when the water was low, I have taken a number of larvae among stones and rubbish in riffles. Sometimes they are taken in nets used for collecting Corydalis larvae, and like them appear to be at home in the swiftest part of the the stream; in this respect differing from most tabanid larvae with which I am acquainted. Larvae taken late in the fall and kept in wet earth and fed on angle-worms or other animal food pass through their transformations and reach the adult stage in late spring or early summer. Since I have never come across these larvae in nature in spring their exact habits at this time of year are not known, but suppose they leave the water and pupate in the earth near at hand.

General color yellowish white, anterior margin of each thoracic segment and a narrow band including the prolegs on the anterior half of the first seven abdominal segments opaque and appearing darker than the other parts, which are more or less shining and usually finely striate longitudinally. Prothoracic segment divided by longitudinal grooves into four nearly equal parts, which may be called the dorsal, ventral and lateral areas. The lateral areas are shining and finely striated on posterior third and opaque on anterior two thirds: the dorsal and ventral areas are opaque on about anterior fourth and distinctly shining on the remaining

parts. The ventral space is quite evidently divided into two equal parts by a longitudinal grove. In order to see the characters of this segment it must be fully extended. The mesothoracic and metathoracic segments have a number of longitudinal grooves, some of which are very narrowly bordered by opaque darker coloring, which proceeds backward from the narrow anterior border of these segments. Each of the first seven abdominal segments has on its anterior part a transverse row of eight tubercles which encircles the segment. These all bear spines or claws at the apexes, excepting a dorsal pair on each of the first three or four segments. They may be called prolegs, since they have the parts necessary to such organs. On the posterior dorsal border of most of the abdominal segments there may be a narrow, irregular, opaque marking of the same color of the narrow band in the region of the prolegs; eighth segment on each side with two narrow, curved markings, which have the appearance of being composed of contiguous punctures. These markings are of the same shade of color as the other darker areas, and the lower one is more than twice as long as the upper.

Length, 20 millimeters. The size of these larvae is rather difficult to give, since a specimen fully extended is longer than at other times.

PUPA.—Length 18, diameter 4 millimeters. Light brown in color, thorax somewhat paler than the abdomen. Antennal and other tubercles of the head and thorax prominent and darker than the surrounding parts. Prothoracic spiracular tubercle slightly elevated, reniform, oblique; rima uniformly curved for nearly its whole length, but just before the anterior end the curvature is stronger but no hook is formed. First abdominal spiracle nearly round; rima nearly uniformly curved, posteriorly very slightly widened just at the end, anteriorly slightly narrowed and curved so as to form a short hook. The other abdominal spiracles agree with the first one in general, but there appears to be slight variation in the enlargement and curvature of the extreme ends. Terminal teeth prominent, shining brown in color, darkest at the extreme tips. Dorsal pair of teeth smallest and closer together than the ventral, lateral teeth longer and larger than the ventral and located much beneath the dorsal, in fact they are nearly midway between the dorsal and ventral.

I have never found the adults of this species especially common, neither have I observed that they molest stock. The male has been procured fully as often as the female on protruding stones in swift-flowing streams, and in sunny spots in woods near such streams. Most of the specimens in my collection were taken during the first half of June.

All the stages of this fly have been procured from the Scioto River in the vicinity of Jones' Dam, near Columbus.